

Risk Factors for Digital Stress in German Public Administrations

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Abstract

Objective: While the digitization of the working world progresses, the demands on employees are changing. Not least this is true for the setting of public administrations in Germany which is currently affected by the transformation to E-Government. This study aims at identifying and describing a risk cluster of digitally stressed employees in those public administrations.

Methods: An online sample of 710 employees from three public administrations in North Rhine-Westphalia was asked about digital stress (7 items) and several potential risk factors (19 items) which were derived from current research. In a first step, a hierarchical agglomerative cluster analysis is used to detect the risk cluster. This is followed by a comparison to the group of the remaining employees regarding their risk profiles.

Results: The analysis states, that the cluster of digitally stressed takes around ten percent of the public administration's employees of the total sample. Employees in the risk cluster are less satisfied with on-site work overall, experience less collegial support on-site, experience less collegial support in the home office, resign more often, are more likely to feel overwhelmed, are less educated, are older in age and more often have relatives in need of care.

Conclusion: This work managed to identify and describe a group of digitally stressed, rather than left-behind employees in public administrations to bring awareness to potentially destructive factors in the digital transformation process, but eventually to social inequalities as well. The findings offer the basis for interventions to arise as well as it evokes potential for further research.

Background

The digitization of the working world has profound effects on the mental health of employees (Cazan 2020). Digitization is described by the German Federal Agency for Civic Education as a process that converts and stores information in machine-readable data, and includes operations of data processing, transmission, and combination (Müller-Brehm et al. 2020). Piasecki (2020) specifies that digitization in the setting of the public administration "essentially means shifting administrative tasks to a new digital level and integrating traditional (paper-based) processes into computer-based processing structures to optimize results and accelerate procedures". The advanced usage of technology profoundly affects the work environment and organization, which results in an "acceleration, increasing abstractness, flexibilization and individualization of processes and results" (Traum et al. 2017).

The work-related digitization is part of the transformation to the working world 4.0, in which routine steps are replaced by knowledge work with complex, dynamically evolving activities, and thus changing the nature of office work. The expansion of existing technologies encourages mobile working at flexible workplaces and flexible working hours (Spath and Bauer 2012). Work 4.0 has become established in the German-speaking world as a term for the fundamental structural transformation in gainful employment resulting from advancing digitization (Widuckel 2020).

With the emergence of the SARS-CoV-2 pandemic in 2020 and the subsequent measures taken with the aim of containing the virus and preventing COVID-19, especially home office for physical rather than social distancing as well as infection protection, digitization at the workplace has experienced a widespread push (Klös 2020).

Digital and mobile communication systems enable companies to collaborate and coordinate over greater physical distance and with time flexibility. It also facilitates access to specialist knowledge, expertise, and resources (Rump and Eilers 2017). The changed work opportunities result in a variety of new work models. Boundaries in different areas, such as between locations, companies, customers and workforces, are becoming increasingly blurred (Rump and Eilers 2017). Routine activities are continuously being automated, so that tasks for employees are becoming more cross-functional and cross-divisional, while work is increasingly information-based. Consequently, the targeted further qualification of the workforce in digital literacy is of crucial importance (Rump and Eilers 2017).

Simultaneously, digital training in the public sector lags behind other industries (Randstad labor barometer 2019). For the German federal state of North Rhine-Westphalia, the E-Government Act (EGovG NRW), including the e-file, was passed with the aim of modernizing public administrations and keeping them competitive and able to act (Ministry of the Interior of the State of North Rhine-Westphalia, Department 14 2021). The model regions, which form the basis of this study, are playing a pioneering role. With the digitization measures; digital services (business, housing subsidies, student grants, etc.), electronic proof of identity, cross-border standardization, Europe-wide usability, digitization of (high) schools and the digital citizens' office, even financial savings are planned to be reached by 2025 (WIRTSCHAFT.NRW 2021). Despite the potential of e-government, so far Germany ranks only 22nd in Europe in terms of the digitization of administration and the introduction of e-government offerings, according to the EU's Digital Economy and Society Index 2020 (DESI 2020).

Digital competence is not only becoming increasingly important in a fast-paced environment but for the preservation of the capability to work as well. Otherwise individual overload occurs, as when the demands and the individual possibilities for control are unbalanced, i.e., when the demands exceed the available resources like the required competence in the work situation (Xanthopoulou et al. 2007, Bakker and Demerouti 2007, Karasek 1979). Continuous overload at the workplace leads to negative health consequences on many levels. Theorell et al. (2015) work out a systematic connection between work environment conditions and symptoms of depression. In another paper, Theorell et al. (2016) find a link between workplace conditions and the development of cardiovascular disease. Nixon et al. (2011) outline the psychosomatic effects of workplace stressors. Stressors were organizational constraints, interpersonal conflict, role conflict, role ambiguity, workload, work hours, and lack of control. All of the occupational stressors were significantly related to physical symptoms. Gastrointestinal problems and sleep disturbances were significantly related to more stressors than other symptoms examined. Work overload and role ambiguity are found to be the two most dominant stressors, whereas intrusive technology characteristics are found to be a dominant predictors of stressors (Ayyagari et al. 2011).

Galluch et al. (2015) confirm effects of digital stress and are experimenting with matched interventions for digital stress management.

Smith et al. (1999) already address resulting occupational stress in human-computer interaction due to increasing technology use at work. Diebig et al. (2020) describe the extent of the psychosocial impact of digitization on health and work, from the macro to the micro level. Körner et al. (2019) break down the origin of perceived stress in human-machine interactions during work to technical conditions (technical problems and poor usability), how attentive or otherwise engaged users are (low situational awareness), and what competences users possess (increasing demands on worker skills). In order to maximize positive effects for individuals and the organization while minimizing negative consequences of digitization, within a qualitative study Diebig et al. (2018) set content- and process-related requirements for the German risk assessment of mental stress in the context of Industry 4.0, which include updated definitions and data collection methods.

Turel et al. (2019) summarize the state-of-the-art of the research on the "dark side of digitization of the individual" as: information system security behaviors, problematic and addictive use of technologies and loss of control over technology-mediated decisions, and technostress, loss of privacy and the blurring of work-life boundaries. As a conclusion, proposed methodological advancements like using a person-centered approach and meta-analytical techniques in further research are discussed.

Gimpel et al. (2020) find, that in Germany the increased work in the home office lengthens the periods in which work is done, due to the intensified mixing of work and private life. At the same time, respondents find less support at work as well as within their own households, as many are equally affected. The effects are evident in increased work-home conflict, among other things. On the contrary, social support would be associated with higher work ability and less disease (Johnson and Hall 1988). Problems attributable to digital work, such as the unavailability of technology, lack of a sense of achievement, or omnipresence, are on the rise (Gimpel et al. 2020).

Individual resources are limited, so it is worth taking a closer look at the resource utilization of employees in order to describe the context-dependent risk group with regard to digital competence and therefore the ability to act and adapt. Clamped and "de-limited" employees tend to be more burdened because of their overall workload. Civil servants are not only stereotypically associated with "service to the rule", coming along with rather recognition conflicts than internal resignation though (Vogel and Pfeuffer 2019). In public administrations, the occupational group of civil servants takes up more than 30 percent (German Federal Agency for Civic Education 2020).

Workers with management responsibility are more accustomed to digital work, because they have already been used to digital working for longer, as might have field service employees and employees who already worked in a home office before the pandemic. People with experience or confidence in dealing with digital technologies and media cope better with the home office situation (Gimpel et al. 2020) .

Parents bear a somewhat higher burden (Gimpel et al. 2020). While children represent a context-dependent stressor in terms of employees' individual resource capacity, they could also promote intergenerational exchanges with "digital natives" (Thalhammer and Schmidt-Hertha 2015). Caring for relatives, on the other hand, represents a risk factor due to engaging resource and is probably associated with less resources for gaining digital competence.

There are several challenges arising for older workers from participating in a workplace intervention addressing work ability (Sippli et al. 2021). However, surprisingly, when Gimpel et al. (2018) examined "digital stress in Germany" they found, digital stress is more pronounced among 25- to 34-year-old workers than among other age groups. With regard to gender, they found, that women worked in more digitalized workplaces and at the same time experience a higher level of digital stress than men. Ragu-Nathan et al. (2008) and Tarafdar et al. (2011) indicate that men experience more digital stress than women based on survey data from the United States though. Current European findings fit the contrary results same as Gimpel et al. (2018) regarding gender within "zoom fatigue", which is significantly more prevalent amongst female workers (Fauville et al. 2021). Following Ragu-Nathan et al. (2008), perceived digital stress decreases with increasing age, education level and experience.

On this basis, this study aims at identifying and describing a risk cluster of employees in German public administration who suffer more often from self-reported digital difficulties. Due to the overall disadvantaged situation, a lower level of general satisfaction is suspected for this group (Gimpel et al. 2019). Referring to the previously discussed requirements of the digital transformation, some characteristics are assumed. Hence, the following hypotheses are tested in order to evaluate, which factors are correlated to a higher burden by the digitization processes.

Methods

It is assumed that the employees within the risk cluster...

1. work full-time more often than part-time or on a marginal basis.
2. are more often civil servants.
3. are less likely to have managerial responsibilities.
4. were (prior to Corona) less likely to be in a home office.
5. are less likely to work in the field.
6. are less satisfied with the on-site work overall,
7. are less satisfied with the home office work overall.
8. are contacted more often outside of work hours.

9. feel less technically supported on-site.
10. feel less technically supported in the home office.
11. experience less collegial support on-site.
12. experience less collegial support in the home office.
13. resign more often.
14. are more likely to feel overwhelmed.
15. are more likely to be female.
16. are less educated.
17. are younger in age.
18. are more likely to have children in the household.
19. more often have relatives in need of care.

While 17 of the 19 hypotheses refer to risk or (context-dependent) resource factors, feeling overwhelmed as well as resignation are to be regarded as psychological strain and thus as consequences of digital stress. The last five hypotheses refer to sozio-demographic attributes.

The data basis for the hypotheses tests is a cross-sectional study that was funded as part of the project "Health and Digital Change" (GudW). The study itself was given a positive vote by the Ethics Committee of the University of Witten/Herdecke under the reference number 158/2020, i.e. it was checked for compliance with the Declaration of Helsinki on Medical Research Involving Human Subjects and with the applicable data protection regulations.

The primary data were collected online from $n = 710$ employees in three German municipal administrations of the project-related digital model regions in North Rhine-Westphalia. These represent the federal state with a rural region, a metropolitan area and an international border region. Considering the sampling frame of 1 319 invited employees and the subsequent response rate of $RR = 0.54$, an online bias is not to be assumed. The employees work primarily in the areas of housing and social services (29 %), human resources and organization (17 %), security and construction (15 % each). First results regarding further outcomes as well as further information on the sample can be found in Claassen et al. (2021). Thus, this is already a multi-outcome study in its approach.

Missing values due to item nonresponse were imputed for the present analysis using MICE (multivariate imputation by chained equations) following Rubin (1986). The first imputed data set without a stochastic component was used. This was followed by a hierarchical agglomerative cluster analysis using complete

linkage to identify the risk cluster (Kaufman and Rousseeuw 2005). The distance matrix was based on Euclidean distances, called L2 norm respectively.

To validate the quality of the cluster solution, a scree plot is used. The optimal number of clusters is the difference between the number of cases to be clustered and the fusion step, after which the distance between two observations ("height" on the Y-axis) increases abruptly.

The second step is a descriptive comparison of the risk-cluster to the group of the remaining employees. Here, the ordinal items of the standardized Likert scale are treated quasi-metrically, so that the arithmetic mean is reported. For dichotomous and nominal variables, the proportion value is reported. Significance testing for differences is performed using two sample t-tests for means and Fisher's exact test for proportions, for each of which the p-value is reported. The associated significance level as the basis for the test decision for the formulated hypotheses is $\alpha = 0.05$.

The seven digitization-related variables that function as the basis of the cluster analysis are different from the variables used to describe risk factors. The former predominantly ask about agreement on a scale of one (strongly disagree) to four (strongly agree) or about stressfulness. The latter relate to work-specific and socio-demographic items, as well as to the frequency of emotional states (feeling overwhelmed, resignation). A presentation of the two groups of variables with the corresponding coding can be found in Table 1 and Table 2.

Table 1

Digitization-related cluster variables

Item	Coding	Label
Dealing with digital applications at work is easy for me.	1 = does not apply 2 = rather does not apply 3 = rather applies 4 = very much applies	Digi1
The increasing digitization in the public administration has no negative impact on my health.	1 = does not apply 2 = rather does not apply 3 = rather applies 4 = very much applies	Digi2
I feel well prepared for digitization by my employer.	1 = does not apply 2 = rather does not apply 3 = rather applies 4 = very much applies	Digi3
I support the switch to digital applications at my work.	1 = does not apply 2 = rather does not apply 3 = rather applies 4 = very much applies	Digi4
Digitization leads to...	1 = more work 2 = just as much work 3 = less work	Digi5
How stressful do you find constant screen work?	1 = stressful	Digi6

	2 = rather stressful	
	3 = rather not stressful	
	4 = not stressful	
How stressful do you find the need to be available via different communication channels at the same time?	1 = stressful	Digi7
	2 = rather stressful	
	3 = rather not stressful	
	4 = not stressful	

Table 2

Work-specific, socio-demographic, and emotional variables

Item	Coding	Label
Do you work full-time, part-time or are you marginally employed?	1 = full time 2 = part time 3 = marginally employed	Working time
Are you a civil servant or an employee covered by collective bargaining agreements?	1 = civil servant 2 = employed according to collective agreement	Civil service
Do you have management responsibility?	1 = yes 2 = no	Management responsibility
How often did you work in a home office before Corona?	1 = never 2 = occasionally 3 = predominantly 4 = always	Home office
How often do you work in the field?	1 = never 2 = occasionally 3 = predominantly 4 = always	Field service
How satisfied are you with on-site work overall?	1 = not satisfied 2 = rather not satisfied 3 = rather satisfied 4 = satisfied	Satisfaction on site
How satisfied are you with home office work overall?	1 = not satisfied 2 = rather not satisfied 3 = rather satisfied 4 = satisfied	Home office satisfaction
How satisfied are you with work-related contact outside of official work hours?	1 = not satisfied 2 = rather not satisfied 3 = rather satisfied 4 = satisfied	Contact free time
How satisfied are you with on-site support for technical	1 = not satisfied	Technical

difficulties (hardware/software issues)?	2 = rather not satisfied 3 = rather satisfied 4 = satisfied	support on site
How satisfied are you with the support in case of technical difficulties (hardware/software problems) in the home office?	1 = not satisfied 2 = rather not satisfied 3 = rather satisfied 4 = satisfied	Technical support in home office
How satisfied are you with the possibility to get on-site support from colleagues if needed?	1 = not satisfied 2 = rather not satisfied 3 = rather satisfied 4 = satisfied	Social support on site
How satisfied are you with the possibility of receiving support from colleagues in the home office when needed?	1 = not satisfied 2 = rather not satisfied 3 = rather satisfied 4 = satisfied	Social support in the home office
How often do you feel resigned?	1 = always 2 = frequently 3 = rarely 4 = almost never	Resignation
How often do you feel overwhelmed?	1 = always 2 = frequently 3 = rarely 4 = almost never	Excessive demands
With which gender do you identify?	1 = female 2 = male 3 = diverse	Gender
What is your highest level of education?	1 = no degree 2 = secondary school diploma 3 = secondary school leaving certificate	Education

	4 = advanced technical college entrance qualification	
	5 = general university entrance qualification	
	6 = university degree	
How old are you in years?	years (numeric)	Age
Are there children living in your household?	1 = yes 2 = no	Children
Are there other relatives you have to take care of?	1 = yes 2 = no	Care

Results

The results of the cluster analysis confirm a two-cluster solution, so that the assumed assignment to a (single) risk cluster can be confirmed empirically. In fact, the scree plot in Figure 1 shows that the distance increases sharply after fusion step 708.

65 of 710 respondents, or 9.15 percent of respondents, are to be found within the identified risk cluster. A description of this cluster in comparison to the non-risk group (including p-values) for the digitization-related cluster variables can be found in Table 3 and for the descriptive variables in Table 4. Significant variables are marked in bold. In this context, the digitization-related cluster variables show an acceptable internal consistency of $\alpha = 0.73$, which means that the items are sufficiently interrelated and around three quarters of the construct's total variance are not due to chance.

Table 3

Group comparison of digitization-related cluster variables

<u>Label</u>	<u>Risk-cluster</u>	<u>Remaining employees</u>	<u>p-value</u>
Digi1 (mean)	2.75	3.42	< 0.001
Digi2 (mean)	1.92	3.28	< 0.001
Digi3 (mean)	1.80	2.43	< 0.001
Digi4 (mean)	2.20	3.37	< 0.001
Digi5 (percentage "more work")	0.66	0.22	< 0.001
Digi6 (mean)	1.83	2.74	< 0.001
Digi7 (mean)	1.97	3.18	< 0.001

Table 4

Group comparison of work-specific, socio-demographic, and emotional variables

<u>Label</u>	<u>Risk-cluster</u>	<u>Remaining employees</u>	<u>p-value</u>
Working hours (percentage "full-time")	0.69	0.74	0.41
Civil service (percentage "yes")	0.38	0.47	0.16
Management responsibility (percentage "yes")	0.27	0.19	0.17
Home office (percentage at least "occasionally")	0.18	0.15	0.23
Field service (percentage at least "occasionally")	0.43	0.47	0.35
Satisfaction on site (mean)	2.80	3.28	0.02
Satisfaction in home office (mean)	3.39	3.16	0.05
Contact free time (mean)	2.90	3.28	0.08
Technical support on site (mean)	2.48	2.87	0.08
Technical support in home office (mean)	2.74	2.94	0.29
Social support on site (mean)	2.96	3.33	0.02
Social support in home office (mean)	2.77	3.21	< 0.01
Resignation (mean)	1.85	2.21	< 0.01
Excessive demands (mean)	1.77	2.40	< 0.001
Gender (percentage "female")	0.61	0.59	0.71
Education (share "university degree")	0.35	0.50	0.03
Age (mean)	48.76	44.13	0.02
Children (percentage "yes")	0.35	0.41	0.37
Care (share "yes")	0.53	0.37	0.02

Significant differences at the five-percent level between the two groups of employees thus emerge for all digitization-related variables, which form the basis for the cluster analysis. There are further significant differences for some, but not all, work-specific and socio-demographic risk factors and emotional strain. This refers specifically to job satisfaction on site, social support on site and in the home office, the emotions resignation and feeling overwhelmed, educational level, age, and dependents in need of care. Accordingly, hypotheses six, eleven, twelve, 13, 14, 16, and 19 receive confirmation, while the remaining hypotheses have to be rejected. Hypothesis 17 as an exception is also significant. However the assumed direction is reversed, because employees in the risk cluster turn out to be older on average. Satisfaction in

the home office is barely not significant at $p = 0.05$, but it is noticeably higher within the risk cluster than among the remaining employees.

Discussion

This study is one of the first of its kind to evaluate digital stress factors in the context of public administrations. As a result, the cluster of digitally stressed takes ten percent of the public administration's employees in relation to the total sample. Employees in the risk cluster are less satisfied with on-site work overall, experience less collegial support on-site, experience less collegial support in the home office, resign more often, are more likely to feel overwhelmed, are less educated, are (unexpectedly) older in age and more often have relatives in need of care.

Resigning and feeling overwhelmed are regarded as stress consequences or strain variables themselves. This indicates that it is of crucial importance to intervene with targeted support to relieve the strain in order to prevent more far-reaching adverse health effects as stated in the introduction. On the other hand, a lack of job satisfaction on site, social support and (high) school education, as well as older age and relatives in need of care, can be identified as risk factors for digitization-related stress.

All other describing assumptions like job position, engagement or digital support, gender or having children cannot be confirmed, because they do not show any significance as variables of this cluster. However, higher satisfaction in the home office of the risk cluster is almost significant, interestingly in the opposite direction to the hypothesis. This suggests that the cluster of the digitally stressed is content to have the opportunity to work from home in order to better combine work and family (e.g. to care for relatives, which applies to more than half of the cluster). This could indicate that the risk cluster is in fact digitally stressed, rather than left behind.

Due to the high level of satisfaction with the home office situation, the expansion of home office options for those employees willing in public administrations represents an impetus for action, while digital leadership as well as leading on distance skills by executive managers have to be developed further. Simultaneously, a transformation from mobile working to fixed home-based telecommuting workstations with the associated German legal implications for ergonomic equipment as well as workplace health promotion could nudge positive effects. For a distinction of telecommuting options see Pearce (2009).

Another sensible intervention derived from the results of this study could be the appointment of "digital pilots" for social support (Groß and Krellmann 2019). Future concepts might transfer the idea of digital pilots to a working world that is, independent of COVID-19 increasingly shaped by phases of physical distance.

Moreover, the expansion of social care advisory services either as employee assistance programs or as a structural offer in the company setting could be supportive, especially for employees with relatives who need care – taking care of the ones who are taking care. This could simultaneously increase the employer's attractiveness and branding.

Contrary to the prior assumption, employees in the risk cluster are younger, which might be traced back to a possible inferiority regarding digital competence acquired off the job. Apart from that, it could be a limitation that the length of the time employees have already spent on the job is not recorded. In addition, no distinction is made between working at home and from different mobile places. Familiarity with mobile working is likely to be associated with more digital affinity.

It also has to be kept in mind that the survey is merely a self-assessment of the burdens as well as the other data. Further research might identify which factors are stressors, resources and which are consequences of psychological stress. Last but not least, it is important to mention, that causation cannot be established, because potential third variable effects as well as their interactions were not controlled for. As a consequence, this study is of explorative nature.

With this study we managed to identify and describe a group of digitally stressed employees in public administrations, not least to bring awareness to potentially disruptive factors in the digital transformation process – and eventually to social inequalities as well. Based on these data, initial approaches for the primary prevention of stress-related illnesses and absences from work that could also improve the attractiveness of employers were discussed briefly. These approaches offer the additional potential to prevent a digital divide early in the process and to maintain the working ability of digitally stressed employees in the long term, which is societally as well as economically desirable. Although the study only looked at employees in public administrations, the analogy to the computer workstation in general is valid. It will therefore be interesting to see how high the proportion of digitally stressed employees is estimated to be in other sectors of the economy based on representative surveys.

Declarations

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Conflicts of interest/Competing interests

All authors declare no conflict of interest.

Availability of data and material

The data sets analyzed during the current study available from the corresponding author on reasonable request.

Code availability

Not applicable.

Authors' contributions

SW was responsible for the conception as well as the methodology and wrote the original article. DRdA conducted the survey, dealt with data curation as well as text review. JK took care of the software, the formal analysis and the visualization. KC responsibilities included validation, supervision, and project administration. All authors read and approved the final manuscript.

Ethics approval

The study was positively approved by the Ethics Committee of the University of Witten/Herdecke under reference number 158/2020, i.e. it was checked for compliance with the Declaration of Helsinki on Medical Research Involving Human Subjects as well as with the applicable data protection regulations.

Consent to participate

Informed consent was obtained from all individual participants included in the study.

Consent for publication

Not applicable.

References

1. Ayyagari, Ramakrishna; Grover, Varun; Purvis, Russell (2011): Technostress: Technological Antecedents and Implications. In: *MIS Quarterly* 35 (4), S. 831. DOI: 10.2307/41409963.
2. Bakker, Arnold B.; Demerouti, Evangelia (2007): The Job Demands-Resources model: state of the art. In: *Journal of Managerial Psych* 22 (3), S. 309–328. DOI: 10.1108/02683940710733115.
3. Cazan, Ana-Maria (2020): The digitization of working life: Challenges and opportunities. In: *PRU* 18 (1), S. 3–6. DOI: 10.24837/pru.v18i1.457.

4. Claassen, Kevin; Rodil dos Anjos, Dominique Rodil Dos; Kettschau, Jan; Broding, Horst Christoph (2021): How to Evaluate Digital Leadership: A Cross-sectional Study. DOI: 10.21203/rs.3.rs-432739/v1.
5. DESI (2020): Digital Economy and Society Index (DESI).
6. Diebig, Mathias; Jungmann, Franziska; Müller, Andreas; Wulf, Ines Catharina (2018): Inhalts- und prozessbezogene Anforderungen an die Gefährdungsbeurteilung psychischer Belastung im Kontext Industrie 4.0. In: *Zeitschrift für Arbeits- und Organisationspsychologie A&O* 62 (2), S. 53–67. DOI: 10.1026/0932-4089/a000265.
7. Diebig, Mathias; Müller, Andreas; Angerer, Peter (2020): Impact of the Digitization in the Industry Sector on Work, Employment, and Health. In: Töres Theorell (Hg.): *Handbook of Socioeconomic Determinants of Occupational Health: From Macro-level to Micro-level Evidence*. Cham: Springer International Publishing, S. 1–15.
8. Fauville, Geraldine; Luo, Mufan; Queiroz, Anna C. M.; Bailenson, Jeremy N.; Hancock, Jeff (2021): Nonverbal Mechanisms Predict Zoom Fatigue and Explain Why Women Experience Higher Levels than Men. In: *SSRN Journal*. DOI: 10.2139/ssrn.3820035.
9. Galluch, Pamela; Grover, Varun; Thatcher, Jason (2015): Interrupting the Workplace: Examining Stressors in an Information Technology Context. In: *J AIS* 16 (1), S. 1–47. DOI: 10.17705/1jais.00387.
10. German Federal Agency for Civic Education (2020): Beschäftigte des öffentlichen Dienstes | bpb. In: *Bundeszentrale für politische Bildung*, 28.11.2020. Online verfügbar unter <https://www.bpb.de/nachschlagen/zahlen-und-fakten/soziale-situation-in-deutschland/61714/oeffentlicher-dienst>, zuletzt geprüft am 16.05.2021.
11. Gimpel, Henner; Bayer, Sarah; Lanzl, Julia; Regal, Christian; Schäfer, Ricarda; Schoch, Manfred (2020): Digitale Arbeit während der COVID-19-Pandemie. Eine Studie zu den Auswirkungen der Pandemie auf Arbeit und Stress in Deutschland.
12. Gimpel, Henner; Lanzl, Julia; Manner-Romberg, Tobias; Nüske, Niclas (2018): Digitaler Stress in Deutschland. Eine Befragung von Erwerbstätigen zu Belastung und Beanspruchung durch Arbeit mit digitalen Technologien.
13. Gimpel, Henner; Lanzl, Julia; Regal, Christian; Urbach, Nils; Wischniewski, Sascha; Tegtmeier, Patricia et al. (2019): Gesund digital arbeiten?! Eine Studie zu digitalem Stress in Deutschland. Online verfügbar unter https://www.fim-rc.de/wp-content/uploads/2020/03/Gimpel_etal_2019_Gesund_digital_arbeiten-Eine_Studie_zu_digitalem_Stress_in_Deutschland.pdf, zuletzt geprüft am 17.05.2021.
14. Groß, Marc; Krellmann, Anika (2019): Das Ökosystem der Digitalisierung. In: *Handbuch E-Government*: Springer Gabler, Wiesbaden, S. 3–18. Online verfügbar unter https://link.springer.com/chapter/10.1007/978-3-658-21402-9_2.
15. Johnson, J. V.; Hall, E. M. (1988): Job strain, work place social support, and cardiovascular disease: a cross-sectional study of a random sample of the Swedish working population. In: *American journal of public health* 78 (10), S. 1336–1342. DOI: 10.2105/ajph.78.10.1336.

16. Karasek, Robert A. (1979): Job Demands, Job Decision Latitude, and Mental Strain: Implications for Job Redesign. In: *Administrative Science Quarterly* 24 (2), S. 285. DOI: 10.2307/2392498.
17. Kaufman, L.; Rousseeuw, P. J. (2005): Finding Groups in Data. An Introduction to Cluster Analysis. Hoboken, New Jersey: Wiley. Online verfügbar unter http://www.ru.ac.bd/stat/wp-content/uploads/sites/25/2019/03/503_09_Kaufman_Finding-Groups-in-Data-An-Introduction-to-Cluster-Analysis.pdf, zuletzt geprüft am 16.05.2021.
18. Klös, Hans-Peter (2020): Nach dem Corona-Schock: Digitalisierungspotenziale für Deutschland.
19. Körner, Ulrike; Müller-Thur, Kathrin; Lunau, Thorsten; Dragano, Nico; Angerer, Peter; Buchner, Axel (2019): Perceived stress in human-machine interaction in modern manufacturing environments- Results of a qualitative interview study. In: *Stress and health : journal of the International Society for the Investigation of Stress* 35 (2), S. 187–199. DOI: 10.1002/smi.2853.
20. Ministry of the Interior of the State of North Rhine-Westphalia, Department 14 (2021): SGV Inhalt : Gesetz zur Förderung der elektronischen Verwaltung in Nordrhein-Westfalen (E-Government-Gesetz Nordrhein-Westfalen - EGovG NRW) | RECHT.NRW.DE. Online verfügbar unter https://recht.nrw.de/lmi/owa/br_text_anzeigen?v_id=73520171220150354215, zuletzt aktualisiert am 06.05.2021, zuletzt geprüft am 06.05.2021.
21. Müller-Brehm, J.; Otto, P.; Puntschuh, M. (2020): Informationen zur politischen Bildung/izpb – Digitalisierung.
22. Nixon, Ashley E.; Mazzola, Joseph J.; Bauer, Jeremy; Krueger, Jeremy R.; Spector, Paul E. (2011): Can work make you sick? A meta-analysis of the relationships between job stressors and physical symptoms. In: *Work & Stress* 25 (1), S. 1–22. DOI: 10.1080/02678373.2011.569175.
23. Pearce, Jonh A. (2009): Successful Corporate Telecommuting with Technology Considerations for Late Adopters. In: *Organizational Dynamics* 38 (1), S. 16–25. DOI: 10.1016/j.orgdyn.2008.10.002.
24. Piasecki, Stefan: Gamification und digitalisierte Verwaltung. Perspektiven für Kreativität und Innovation? In: *HMD*.
25. Ragu-Nathan, T. S.; Tarafdar, Monideepa; Ragu-Nathan, Bhanu S.; Tu, Qiang (2008): The Consequences of Technostress for End Users in Organizations: Conceptual Development and Empirical Validation. In: *Information Systems Research* 19 (4), S. 417–433. DOI: 10.1287/isre.1070.0165.
26. Randstad labor barometer (2019): Randstad Studie: Öffentlicher Sektor beim Thema Digitalisierung abgehängt. In: *Randstad*, 30.01.2019. Online verfügbar unter <https://www.randstad.de/ueber-randstad/presse/digitaler-wandel/studie-oeffentlicher-sektor-bei-digitalisierung/>, zuletzt geprüft am 06.05.2021.
27. Rubin, Donald B. (1986): Statistical Matching Using File Concatenation with Adjusted Weights and Multiple Imputations. In: *Journal of Business & Economic Statistics* 4 (1), S. 87. DOI: 10.2307/1391390.
28. Rump, Jutta; Eilers, Silke (2017): Auf dem Weg zur Arbeit 4.0 - Innovationen in HR. Arbeit 4.0 – Leben und Arbeiten unter neuen Vorzeichen. Online verfügbar unter

<https://www.springer.com/de/book/9783662497456>, zuletzt geprüft am 06.05.2021.

29. Sippli, Khira; Schmalzried, Pia; Rieger, Monika A.; Voelter-Mahlknecht, Susanne (2021): Challenges arising for older workers from participating in a workplace intervention addressing work ability: a qualitative study from Germany. In: *International archives of occupational and environmental health*. DOI: 10.1007/s00420-020-01639-x.
30. Smith, Michael J.; Conway, Frank T.; Karsh, Ben-Tzion (1999): Occupational Stress in Human Computer Interaction. In: *Economica* 70 (280), S. 691–697. DOI: 10.1046/j.0013-0427.2003.00027.x.
31. Spath, Dieter; Bauer, Wilhelm (2012): Working environments 4.0. How we will live and work tomorrow = Arbeitswelten 4.0 : wie wir morgen arbeiten und leben. Stuttgart: Fraunhofer Verlag. Online verfügbar unter http://web.archive.org/web/20181112215452/http://office21.de/wp-content/uploads/2018/06/Studie_Arbeitswelten_4.0_2012.pdf.
32. Tarafdar, Monideepa; Tu, Qiang; Ragu-Nathan, T. S.; Ragu-Nathan, Bhanu S. (2011): Crossing to the dark side. In: *Commun. ACM* 54 (9), S. 113–120. DOI: 10.1145/1995376.1995403.
33. Thalhammer, Veronika; Schmidt-Hertha, Bernhard (2015): Intergenerationelle innerfamiliäre Unterstützungsprozesse bei der Mediennutzung von älteren Erwachsenen. In: *Z Erziehungswiss* 18 (4), S. 827–844. DOI: 10.1007/s11618-015-0633-7.
34. Theorell, Töres; Hammarström, Anne; Aronsson, Gunnar; Träskman Bendz, Lil; Grape, Tom; Hogstedt, Christer et al. (2015): A systematic review including meta-analysis of work environment and depressive symptoms. In: *BMC public health* 15, S. 738. DOI: 10.1186/s12889-015-1954-4.
35. Theorell, Töres; Jood, Katarina; Järvholm, Lisbeth Slunga; Vingård, Eva; Perk, Joep; Östergren, Per Olov; Hall, Charlotte (2016): A systematic review of studies in the contributions of the work environment to ischaemic heart disease development. In: *European journal of public health* 26 (3), S. 470–477. DOI: 10.1093/eurpub/ckw025.
36. Traum, Anne; Müller, Christoph; Hummert, Henning; Nerdinger, Friedemann W. (2017): Digitalisierung. Die Perspektive des arbeitenden Individuums. Rostock: Universität Rostock, Seniorprofessur Wirtschafts- und Organisationspsychologie; Universitätsbibliothek (White Paper Series / Universität Rostock, Seniorprofessur Wirtschafts- und Organisationspsychologie, Nr. 1).
37. Turel, Ofir; Matt, Christian; Trenz, Manuel; Cheung, Christy M.K.; D’Arcy*, John; Qahri-Saremi*, Hamed; Tarafdar*, Monideepa (2019): Panel report: the dark side of the digitization of the individual. In: *INTR* 29 (2), S. 274–288. DOI: 10.1108/INTR-04-2019-541.
38. Vogel, Berthold; Pfeuffer, Andreas (2019): Wertschätzungskonflikte statt Jobkultur. Arbeiten und Arbeitshaltungen im öffentlichen Sektor. In: *Governance und Arbeit im Wandel*: Springer VS, Wiesbaden, S. 75–91. Online verfügbar unter https://link.springer.com/chapter/10.1007/978-3-658-23896-4_5.
39. Widuckel, Werner (2020): Arbeit 4.0 und Transformation der Mitbestimmung. In: Verena Bader und Stephan Kaiser (Hg.): *Arbeit in der Data Society: Zukunftsvisionen für Mitbestimmung und Personalmanagement*. Wiesbaden: Springer Fachmedien Wiesbaden, S. 17–34.

40. WIRTSCHAFT.NRW (2021): Das E-Government-Gesetz | WIRTSCHAFT.NRW. Online verfügbar unter <https://www.wirtschaft.nrw/das-e-government-gesetz>, zuletzt aktualisiert am 06.05.2021, zuletzt geprüft am 06.05.2021.
41. Xanthopoulou, Despoina; Bakker, Arnold B.; Demerouti, Evangelia; Schaufeli, Wilmar B. (2007): The role of personal resources in the job demands-resources model. In: *International Journal of Stress Management* 14 (2), S. 121–141. DOI: 10.1037/1072-5245.14.2.121.

Figures

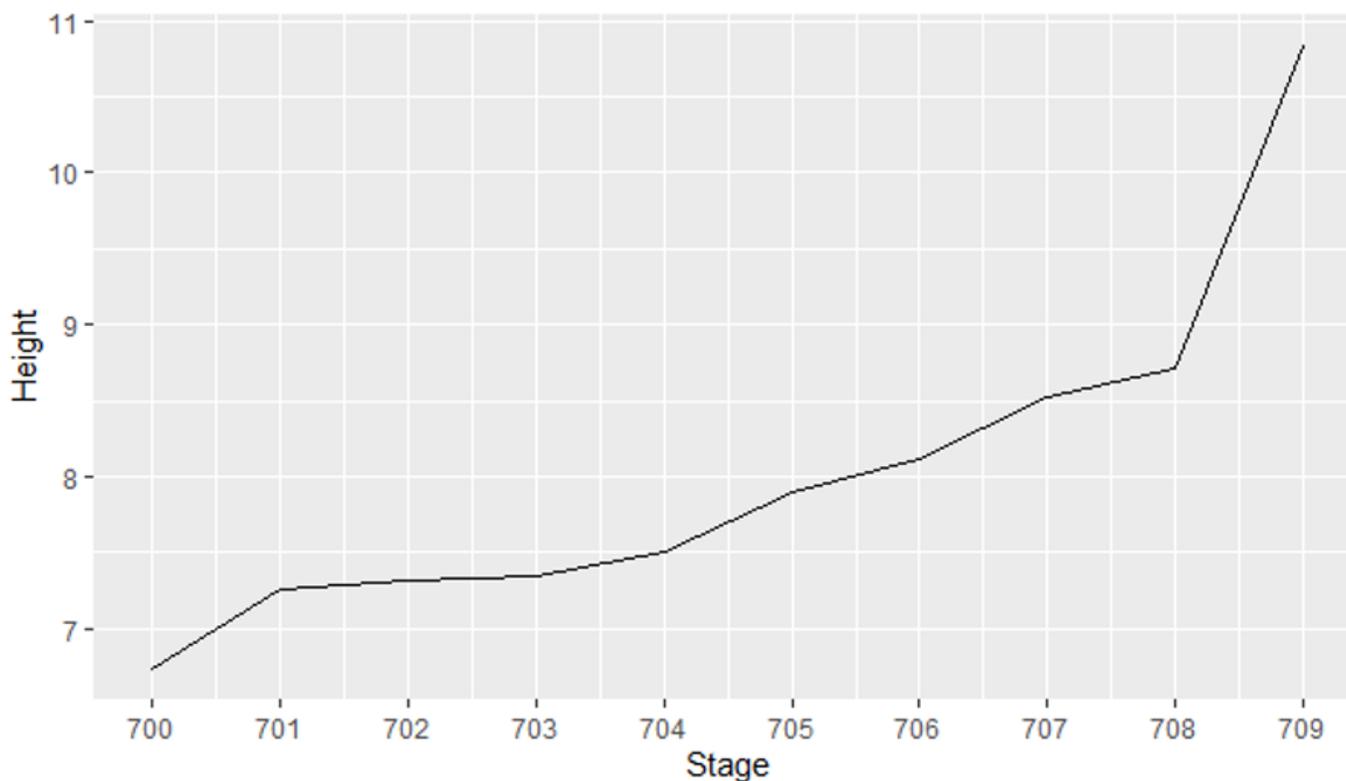


Figure 1

Scree plot for the risk cluster